



The Effect of Educational Intervention Based on Health Belief Model and Social Support on Promoting Skin Cancer Preventive Behaviors in a Sample of Iranian Farmers

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Abstract

Skin cancer is one of the most common cancers in Iran. Farmers are exposed to the sun's ultraviolet radiation due to their job and are susceptible to skin cancer. The aim of this study is to survey the effect of educational intervention based on health belief model and social support on promoting skin cancer preventive behaviors in farmers of Fasa City, Fars province, Iran. In this quasi-experimental study, 200 farmers (100 in experimental group and 100 in control group) in Fasa City, Fars, Iran, were selected in 2017. The educational intervention for the experimental group consisted of eight training sessions (introduction to skin cancer, risk factors, complications, benefits and barriers to proper use of sunscreen, UV sunglasses and physical protection, self-efficacy in applying preventive behaviors, role of social support). A questionnaire consisting of demographic information, knowledge, HBM constructs (perceived susceptibility, severity, benefits, barriers, self-efficacy and cues to action), and social support was used to measure skin cancer preventive behaviors before, 3 months after the intervention, and 6 months later. Data were analyzed using SPSS-22 via chi-squared, independent samples *t* test, Mann-Whitney, and repeated measures ANOVA at a significance level of 0.5. The mean age of the farmers was 42.21 ± 10.52 years in the experimental group and 44.28 ± 10.16 years in the control group. Three months after the intervention and 6 months after the intervention, the experimental group showed a significant increase in the knowledge, perceived susceptibility, perceived severity, perceived benefits, self-efficacy, cues to action, social support, and skin cancer preventive behaviors compared to the control group. This study showed the effectiveness of the intervention based on the HBM constructs and social support in adoption of skin cancer preventive behaviors in 3 and 6 months post intervention in farmers. Hence, these models can act as a framework for designing and implementing educational interventions for the prevention of skin cancer.

Keywords Farmer · Health belief model · Social support nurses · Skin cancer · Fasa City

Introduction

Skin cancer is one of the most common cancers in most countries of the world, and its prevalence has increased in the last decade so that it has become an epidemic status [1]. It is

observed as melanoma and non-melanoma. The two most common types of non-melanoma cancer are basal cell carcinoma and squamous cell carcinoma [2]. The annual incidence of non-melanoma is two to three million cases, while at least 132,000 melanoma cases occur in the world [3]. More than half of incidence cases of the cancer and two thirds of death occur in low- and middle-income countries. The cancer incidence pattern is different in various geographical regions, mainly because of the differences in risk factor [4]. The most common cause of skin cancer is continuous exposure to sunlight [5], and 90% of the causes of skin cancers are attributed to sunlight [6]. Sunlight is the most important risk factor. In addition to the beneficial effects of this radiation, without the use of protective equipment, it may cause serious injuries, including malignant melanoma which is the most invasive form of skin cancer associated with a high mortality [7].

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Avoiding contact with sunlight can reduce the risk of skin cancer due to reduced exposure to sunlight which is an effective factor in sunburn, and prevention of harmful cumulative effects of sunlight [8]. Therefore, promotion of protective behaviors in preventing skin cancer is essential. The statistics of World Health Organization show that about two to three million non-melanoma skin cancers and 132,000 melanoma skin cancers occur annually throughout the world [9]. According to estimates, the incidence of various skin cancers in 2020 will rise to 20 million [10].

Agriculture is one of the oldest professions for subsistence, and the people doing this profession are among the groups most exposed to sunlight due to their occupation. Their job requires them to be exposed to sunlight several hours a day, and if they do not have adequate coverage to protect themselves from sunlight, they will be prone to skin cancer. Hence, they have to use the following simple strategies to protect against the sunlight and significantly reduce the incidence of the disease: limiting outdoor activities, avoiding exposure to sunlight from 10:00 a.m. to 4:00 p.m., using protective clothing, and using sunscreen [11].

Most farmers in Iran are males, and a relatively small proportion of women are agricultural workers in Iran, so the incidence of cancer in men is higher [11–13].

The study conducted by Afshari et al. showed that the use of protective equipment against the sun is low among farmers [14]. In addition, a study by Nahar et al. revealed that protective behaviors against skin cancer were low among workers [1]. A study conducted by Razi et al. showed that the incidence of skin cancer is rising in Iran and the sex ratio was more in men than women in all provinces. The age-standardized incidence rate (ASR) of skin cancer was highest in males in Semnan, Isfahan, and Hamedan provinces. The lowest ASR in male was observed in Sistan and Baluchestan provinces. Data used in this study were obtained from a national registry of cancer cases and the Disease Management Center of Ministry of Health in Iran [15].

In another study by Ghoncheh et al., skin cancer had a high incidence in the southern provinces of Iran. A total of 6230 cases of skin cancer during 6 years (2003–2008) were recorded in those provinces, and the incidence rate of skin cancer was increasing. In all years of the study, skin cancer incidence was higher in males than women. In terms of frequency, Fars, Khuzestan, Bushehr, and Hormozgan provinces had the highest age-standardized incidence [16].

According to these reports, creating sun protective behaviors among people exposed to sunlight is of great importance.

Epidemiologically, the most important etiologic agent of all types of skin malignancies is ultraviolet radiation [17]. The effects of ultraviolet radiation on the skin are divided into two categories including short term and long term. The short-term effects include tanning, redness, sunburn, and heat stroke. The long-term effects in epiderm (the upper or outer layer of the

two main layers of cells that make up the skin) and derm (the thick layer of living tissue below the epidermis which forms the true skin, containing blood capillaries, nerve endings, sweat glands, hair follicles, and other structures) include lentigo, actinic keratosis, basal cell carcinoma, squamous cell carcinoma, melanoma, collagen and elastin collapse, skin aging, and telangiectasia [18].

In Iran, due to the intense sunlight in most seasons and the lack of using appropriate protective equipment such as hats and clothing in open environments, a high incidence of skin cancer can be expected [13]. Since ultraviolet radiation is at high levels in the southern areas of Iran [19], and the radiation intensity is an important risk factor for skin cancer, the distribution of cancers in these areas may differ from other parts of the country [13].

According to Babazadeh et al. study, mean percent of skin cancer preventive behaviors among rural farmers in Iran was 21.68 [5].

The results of the literature review study by Nahar et al. showed that there was low usage of sun protection methods among the Iranian population. The findings of this study show that efforts to prevent skin cancer are needed. Education concerning the dangers of sun exposure as well as strategies used to prevent or lower the risk of developing skin cancer should be stressed [20].

Moreover, the patterns of cancer incidence in different geographical locations are different due to the difference in risk factors, and in order to do a better planning, the disease state should be determined in any region [21]. In a study conducted by Babazadeh et al. using the constructs of the protection motivation theory (PMT) to promote skin cancer preventive behaviors (SCPBs) among rural farmers in Chalderan City, Iran, the mean score of the PMT constructs increased in the experimental group after the educational intervention [22].

Considering the high rates of skin cancers among Iranian farm workers, it is vital to increase their use of sun protection practices. Increasing sun protection strategies among this population should be a public health priority. Future interventions should focus on shifting farm workers' attitudes towards skin cancer risk and prevention. Moreover, public health professionals should consider developing and testing theory-based educational interventions targeting the sun protection behaviors of farm workers. Much more attention has to also be given to developing practical ways of increasing sun protective strategies in the Iranian agricultural workplace [23].

Perhaps variation between the results can be justified by the fact that those studies have been done outside Iran where there are fewer cultural obstacles against the behavior of using sunglasses, and also, they examined people with higher ages. People in higher ages possibly have more knowledge regarding symptoms of sun overexposure (skin redness and blistering, pain and tingling, swelling, headache, fever and chills, nausea, dizziness, dehydration). Lack of knowledge about

necessity of using gloves (in summer time), cultural beliefs, and considering the gloves to be inefficient have been shown to be the most prevalent obstacles for using gloves by farmers. The level of using gloves as a behavior among farmers to protect against sunlight is low for which the most possible reason is low level of farmers' knowledge about necessity of using gloves in summer time. The other obstacle stated by farmers was cultural and religious beliefs. Cultural belief about this issue mainly is that using gloves is special to winters and using them in summer time is not normal [12, 13].

Farmers have a major role in preventing skin cancer, so educating them is a necessity. But the value of an education depends on its effectiveness as well as change with health behaviors. Educational effectiveness depends on the proper use of behavioral science theories [24]. Hence, researchers have been using some models for changing behavior. One of these effective models in health education is the health belief model that considers behavior as a dependent of knowledge and attitude of the individual, and regarding the constructs of this model, it leads to people's perception of health-threatening subjects and thus leads their behaviors to health [25]. It is a comprehensive model that is most commonly used to prevent diseases and reflects the relationship between beliefs and behaviors. This pattern is based on the assumption that preventive behaviors (people's vulnerability to diseases, the impact of diseases on people's lives, and the impact of health measures on reducing the severity of diseases) are on the basis of personal beliefs. The health belief model constructs include modifying factors (structural variables include knowledge, age, sex, ethnicity, personality, and socioeconomic), perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy [25].

According to this model, the following steps must be taken to adopt the (initial prevention) behaviors in order to ultimately function properly in the prevention of skin cancer: Farmers should (1) feel the risk of the problem (perceived susceptibility), (2) understand the depth of this risk and the severity of its various complications (perceived severity), (3) get familiar with positive symptoms from the environment and the accelerating factors that are critical to the person's need for action (their sources of sun protection information such family members, physicians, and staff of health centers) (cues to action), (4) believe that the preventive behaviors are useful and effective (perceived benefits), (5) find preventative factors for preventing behaviors less costly than their benefits (perceived barriers), and (6) find themselves able to do preventive behaviors (self-efficacy). There are several limitations of the HBM which limit its utility in public health such as

1. It does not account for a person's attitudes, beliefs, or other individual determinants that dictate a person's acceptance of a health behavior.
2. It does not take into account behaviors that are performed for non-health-related reasons such as social acceptability.
3. It does not account for environmental or economic factors that may prohibit or promote the recommended action.
4. It assumes that everyone have access to equal amounts of information on the illness or disease [26].

This model is mostly used to collect data on individual behavior variables. However, there are other factors that can lead to behavior. Behavior modification and prevention programs are successful if they are flexible and tailored to individual features and characteristics [27, 28]. Social support structure of social cognitive theory were evaluated in this study to compensate for the deficiencies of HBM. Studies have shown that social support has positive effects on various aspects of skin cancer prevention activities [29]. Social support is defined as "the facilities that others provide to an individual." This concept is also considered as a cognition that makes one believe that s/he is respected and loved by others, is an element of value and dignity, and belongs to a social network of mutual relations and obligations [30].

Social support is assessed through the evaluation of others as a source, and comes from numerous sources such as spouse, family and friends [31]. In study by Najafi et al., statistically significant association was found between SCPBs and social support [32].

Several studies have been conducted to investigate the factors affecting awareness and preventive behaviors and educational interventions in prevention of skin cancer, among which are the ones by Zareban et al. [33], Nadrian et al. [34], Tabatabayian et al. [35], Mazloomi Mahmood Abad et al. [36], Tazval et al. [37], Afshari et al. [14], Sadeghi et al. [38], Hernandez et al. [39], Davis et al. [40], Babazadeh et al. [5], Dehbari et al. [41], Velasques et al. [42], and Hillhouse et al. [43].

The city of Fasa (one of the southern cities of Iran in Fars province with a population of about 200,000 people) is one of the agricultural hubs. One third of the cancers in this city are skin cancers that are ranked first among all cancers [44], and so far, no similar study has been conducted on skin cancer preventive behaviors in the city. Our study framework was comprised of constructs from the HBM and social support theory, which have been under-addressed in previous studies. This study aimed to determine the effect of educational intervention based on the health belief model and social support on the promotion of skin cancer preventive behaviors among the farmers.

Materials and Methods

This study was first approved by the Research Council of Fasa University of Medical Sciences and then coordinated with the

health centers and the Agricultural Jihad Department in Fasa City, Fars province, Iran. This interventional study was conducted in 2017. The sample size was calculated as 82 persons in each group (the experimental and control group) using the ratio difference formula and taking into account 95% confidence level, 80% power, and the score difference before and after the intervention about 3.3 with standard deviation of 7, but due to the probability of a decrease in the number of the samples, 100 people were considered for each group [38, 45].

Two health centers were selected (Sheshdeh Health Center as the experimental group and Dogan Health Center as the control group) by simple random sampling from six health centers of Fasa City. The subjects selected from this two health centers through convenience sampling.

The inclusion criteria for entering the study included being male, farmer, and resident of Fasa. The exclusion criteria were unwillingness to continue to participate in the study and more than two absences in the training sessions.

The educational intervention for the experimental group consisted of eight training sessions lasting 55 to 60 min, including lectures, group discussions, questions, and answers, as well as the use of educational posters and pamphlets, showing films, and PowerPoint presentations. The educational program was implemented by a Ph.D. in Health Education and Health Promotion and a dermatologist in cooperation with five public health experts. The details of the training sessions were as follows:

First session: introduction to skin cancer and its signs, complications, and diagnosis (perceived susceptibility, severity and cues to action).

Second session: the prevalence of skin cancer and its risk factors, sun damage skin (perceived susceptibility and severity).

Third session: A 50-year-old male farmer who was diagnosed with skin cancer was invited to show as a model and talk to the subjects about skin cancer and its risk factors, symptoms, and complications (perceived susceptibility, severity, and cues to action).

Fourth session: sun protection methods, benefits and barriers to proper use of sunscreen, benefits and barriers, and the use of physical protection (such as hats, caps, and gloves) (perceived benefits and barriers).

Fifth session: benefits and barriers to the use of UV sunglasses, spending shorter time outside home, and traffic in the shadows and covered areas (perceived benefits and barriers).

Sixth session: following skin cancer preventive behavior recommendations, self-efficacy in applying preventive behaviors for skin cancer (self-efficacy)

Seventh session: The session was held in the presence of at least one family member and health centers staffs, and their roles in adopting and facilitating preventive behaviors for skin cancer was explained (social support).

Eighth session: Participants were divided into groups of 25 people each, and the role of peers and friends in adopting skin cancer preventive behaviors was explained. The previous sessions were reviewed, and the subjects were provided with educational pamphlets (all constructs).

The educational program was held for four groups of 25 (100 people in the intervention group), and the classes were held once a week in the health centers. At the end of the educational sessions, a manual was provided to the subjects. To maintain and enhance the subjects in the experimental group, they were sent a weekly text message on skin cancer, and a telegram group was set up to exchange information. An educational session was also held once a month to follow up their activities.

In order to observe ethical considerations in this study, in addition to obtaining permission from the Ethics Committee of Fasa University of Medical Sciences and Fasa Health Center and justifying the subjects as well as obtaining their agreement, the goals, importance, and necessity of conducting the research project were explained to the subjects and their written consent was obtained. The subjects were assured that their information would remain confidential. Both experimental and control groups participated in the study from the beginning to the end of the study, and no one was excluded from the study. The control group did not receive any training and was only invited to the special sessions to fill out the questionnaires. However, due to ethical considerations, a training session on skin cancer was held for this group after the completion of the study.

The tool used in this research was a questionnaire prepared from different sources [5, 34, 38, 46]. Anonymous and coded questionnaires were arranged in five sections.

The first section included demographic information with four questions about age, marital status, education, and history of skin cancer family members (father, mother, sister, and brother).

The second section included eight questions related to knowledge (modifying factor) measurement.

The third part was related to measuring the health belief model construct. In this section, there were seven questions on perceived susceptibility, five questions on perceived severity, six questions on perceived benefits, five questions on perceived barriers, six questions on cues to action, and six questions on self-efficacy construct.

The questions were scored differently. Regarding the questions on knowledge and cues to action, 2 points were given to the answer “yes” and 1 to “no” or “I do not know”; the range of the scores for knowledge was 8 to 16, and it was 6 to 12 for cues to action. The scores for perceived benefits, perceived barriers, attitudes, and performance were based on the Likert scale, and the answers “I totally agree,” “I agree,” “I have no

idea,” “I disagree,” and “I totally disagree” were, respectively, scored 5, 4, 3, 2, and 1. The scores for perceived benefits, self-efficacy, perceived severity and barriers, and perceived susceptibility ranged 6 to 30, 6 to 30, 5 to 25, and 7 to 35, respectively.

The fourth section was social support construct assessment, and there were eight questions based on a five-point scale (totally agree to totally disagree). The scores ranged from 8 to 40.

Section 5 was related to preventive behaviors against skin cancer, which included 10 questions as “yes” or “no” options. The range of the scores was 0 to 10, and it was self-reported.

The item validity was evaluated by calculating the score index of the effect of the item to be higher than 0/15 and the index of content validity ratio to be higher than 0/79. In order to determine the face validity of the tool, a list of written items was considered as the target population by 30 individuals with the similar demographic, economic, and social characteristics. In order to determine the content validity, the comments by 12 experts (outside the research team) in the fields of health education and health promotion (10 people), dermatologist (1 person), and vital statistics (1 person) were used. Using the Lawshe table, we considered the largest items (0/56 for 12 people) essential and important and retained them for further analysis. The values calculated in this study were above 0.70 for most items.

The reliability of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy, and social support was confirmed to be 0.84, 0.77, 0.78, 0.82, 0.78, 0.79, and 0.78, respectively. To determine the effectiveness of the intervention, the questionnaire was completed by both experimental and control groups in before the intervention, 3 months later, and 6 months after the educational intervention.

The data were analyzed using SPSS-22 software and chi-squared, Mann-Whitney, and repeated measures ANOVA tests. A significant level of 0.05 was considered as well.

Results

In this study, 200 male farmers (100 in the experimental group and 100 in the control group) were examined. The mean age of the subjects was 42.21 ± 10.52 years in the experimental group and 44.28 ± 10.16 years in the control group, and the independent *t* test did not show a significant difference between the two groups ($p = 0.162$). Other demographic characteristics of the subjects did not show any significant difference in the two groups either (Table 1).

The results showed that before the intervention, there was no significant difference between the experimental and control groups in terms of knowledge, perceived susceptibility, perceived severity, perceived benefits, cues for action, perceived self-efficacy, and social support and preventive behaviors against skin cancer, but 3 months after the intervention and 6 months later, the experimental group showed a significant increase in each construct compared to the control group, except for the perceived barriers, and had a significant decrease in the perceived barriers compared to the control group. There was no significant change in control group (Tables 2 and 3).

Discussion

One of the key ways of preventing skin cancer in societies is the use of behavioral change models such as the health belief model and the social support theory. The results of this study showed that utilization of the health belief model and social support can be used as a basis for skin cancer prevention educational intervention for Iranian farmers.

Farmers are exposed to the sun’s ultraviolet radiation due to their job and are susceptible to skin cancer. Therefore, in order to control this critical issue, the theory-based education is essential for the prevention of skin cancer. The results of the present study indicated a significant increase in the mean score

Table 1 Comparison between distribution frequency of individual characteristics of the experimental and control groups

Variable	Experimental group (<i>n</i> = 100)		Control group (<i>n</i> = 100)		<i>p</i> value	
Education	Number	Percent	Number	Percent	0.184	
	Illiterate	14	14	16		16
	Elementary	45	45	40		40
	Junior	30	30	32		32
	High school	8	8	10		10
Marital status	Academic	3	3	2	2	0.215
	Single	8	8	12	12	
	Married	83	83	84	84	
	Divorced	4	4	2	2	
History of cancer in family	Widow	5	5	2	2	0.264
	Yes	6	6	5	5	
	No	94	94	95	95	

Table 2 Comparison between the mean scores of the knowledge and health belief model constructs in the experimental and control groups before, 3 months, and 6 months after the educational intervention

Variable	Group	Before the intervention <i>M</i> ± <i>SD</i>	3 months after the intervention <i>M</i> ± <i>SD</i>	6 months after the intervention <i>M</i> ± <i>SD</i>	<i>p</i> value
Knowledge	Experimental	9.25 ± 2.16	12.71 ± 2.25	14.01 ± 1.46	0.001
	Control	9.14 ± 2.30	9.22 ± 2.14	9.25 ± 2.16	0.114
	<i>p</i> value	0.314	0.001	0.001	
Perceived susceptibility	Experimental	14.31 ± 2.65	21.17 ± 2.66	29.34 ± 2.13	0.001
	Control	15.01 ± 2.24	15.18 ± 2.10	15.22 ± 2.11	0.126
	<i>p</i> value	0.224	0.001	0.001	
Perceived severity	Experimental	10.18 ± 2.32	18.30 ± 2.16	21.87 ± 2.64	0.001
	Control	11.08 ± 2.29	12 ± 2.13	12.13 ± 2.12	0.102
	<i>p</i> value	0.114	0.001	0.001	
Perceived benefits	Experimental	11.25 ± 2.18	20.51 ± 2.16	26.14 ± 2.10	0.001
	Control	11.84 ± 2.20	12.04 ± 2.18	12.38 ± 2.55	0.078
	<i>p</i> value	0.127	0.001	0.001	
Perceived barriers	Experimental	19.24 ± 2.12	12.34 ± 2.74	9.21 ± 2.14	0.001
	Control	18.94 ± 2.35	18.55 ± 2.24	17.72 ± 2.44	0.117
	<i>p</i> value	0.420	0.001	0.001	
Cues to action	Experimental	8.21 ± 2.01	9.85 ± 1.04	10.06 ± 1.21	0.001
	Control	8.14 ± 1.98	8.25 ± 1.97	8.30 ± 1.94	0.096
	<i>p</i> value	0.091	0.001	0.001	
Perceived self-efficacy	Experimental	12.25 ± 2.44	19.66 ± 2.28	12.51 ± 2.80	0.001
	Control	13.90 ± 2.27	14.15 ± 2.14	15 ± 2.08	0.184
	<i>p</i> value	0.214	0.001	0.001	

of knowledge regarding the ways of preventing exposure to sunlight and the predisposing factors of skin cancer in the experimental group in 3 and 6 months after the intervention. The reason for the increase in knowledge could be the access of the experimental group to educational materials and participation in the educational classes held by the researchers.

Before the educational intervention, the knowledge of the subjects was not at a favorable level, and the results of other studies were consistent with those of the present one [36, 46–49].

The results of the studies by Mazloomi Mahmood Abadi et al. [36], Zareban et al. [33], Hoseini et al. [50], Sadeghi et al. [38], Stankeviciūte et al. [51], Saridi et al. [7], and Velasques et al. [42] showed that educational interventions increased the knowledge of the individuals.

In the present study, the educational intervention increased the perceived susceptibility score of the experimental group in 3 and 6 months after the intervention. This means that after the

intervention, most of the farmers in the experimental group believed that they were at risk for skin cancer. The results of this study are consistent with those of Baghianimoghadam et al. [52], Maseudi et al. [53], Hillhouse et al. [43], and Jeihooni et al. [54].

In the studies by Babazadeh et al. [5] and Tazval et al. [37], perceived susceptibility construct predicted skin cancer preventive behaviors.

In the pre-intervention stage, there was no significant difference between the two groups in terms of perceived severity. However, after the educational intervention, the experimental group showed a significant increase compared to the control group. The more people were aware of the consequences and costs of the disease for themselves and their families, the higher the likelihood of doing protective behaviors would be.

According to the study conducted by Hall et al., those with a history of sunburn showed a higher rate of doing protective behaviors, such as wearing protective clothing [55]. The

Table 3 Comparison between the mean scores of social support construct and skin cancer preventive behaviors in both the control and experimental groups before and 3 and 6 months after the intervention

Variable	Group	Before the intervention	3 months after the intervention	6 months after the intervention	<i>p</i> value
Perceived social support	Experimental	16.54 ± 3.21	27.20 ± 3.12	33.34 ± 3.16	0.001
	Control	17.21 ± 3.10	18.01 ± 3.15	18.75 ± 3.24	0.225
	<i>p</i> value	0.152	0.001	0.001	
Skin cancer preventive behaviors	Experimental	2.25 ± 1.32	5.95 ± 1.84	7.25 ± 1.75	0.001
	Control	2.40 ± 1.27	2.45 ± 1.26	2.51 ± 1.31	0.814
	<i>p</i> value	0.104	0.001	0.001	

results indicated that when people got aware of the harmful effects of the sunlight, they were more likely to do protective behaviors. Thus, the testimonials of people who have experienced sun-damaged skin and skin cancer can be used in educational interventions to increase the individuals' perceived severity. Findings of the studies by Sadeghi et al. [38], Khani Jeihooni et al. [56], and Maseudi et al. [53] were consistent with those of the present study. In the study by Kaviani et al. [57], perceived severity predicted skin cancer preventive behaviors.

The mean score of perceived benefits in the experimental group showed more increase than that of the control group 3 and 6 months after the intervention. In a semi-experimental study by Sadeghi et al. on 200 farmers in Sirjan, Iran, the educational intervention based on the health belief model increased the mean score of perceived benefits in the experimental group [38]. The results of other studies were consistent with this research [58, 59].

The reason for increased perceived benefits in this study might be the great emphasis on the use of skin cancer preventing methods as well as personal protection and its benefits, and also incorporating the trainings related to understanding this concept in the education sector.

The results of this study showed that there was no significant difference between the experimental and control groups regarding the perceived barrier score, while the difference was significant in 3 and 6 months after the intervention, and the experimental group showed a significant decrease compared to the control group. In other words, the effect of the educational intervention was the elimination of the barriers to applying skin cancer preventive behaviors. In the studies by Kashfi et al. [60], Khani Jeihooni et al. [56], and Sedeghi et al. [38], perceived barriers of the population under study had declined after the interventions.

Studying the mean scores of self-efficacy in the present study indicated that the belief in the ability to do skin cancer preventive behaviors was low in both the experimental and control groups before the intervention. But after the intervention, the experimental group showed a significant increase in its self-efficacy score. Self-efficacy refers to the judgment of the individual about being confident in his/her ability to perform a particular task and depends on the individual's sense of control over his/her environment and behavior. Individuals with more self-efficacy have higher goals and become more committed, and their behavior is consequently more desirable [61]. The results of this study are consistent with those of Mirzaei et al. [46], Babazadeh et al. [5], Tazval et al. [37], and Dehbari et al. [41]. Regarding the increased score of perceived self-efficacy, it can be said that the farmers' beliefs in doing protective behaviors (sunscreen, hats, covering clothes, and canopies) to prevent skin cancer increased as well. The cues to action is a factor that addresses perceived social pressures and internal stimuli (the cues for external and internal

actions) that have led people to adopt skin cancer preventive behaviors.

In this study, the mean score of the cues for action was significantly higher in the experimental group than the control group 3 and 6 months after the intervention. The cues for action in this study mainly included family members, physicians, and staff of health centers and healthcare homes whose influential role as the source of information as well as the people's supporters was critical for the prevention of skin cancer.

The results of this study are consistent with those of the research by Sadeghi et al. [38] and Jeihooni et al. [54]. In the study by Zareban et al., the cues for action were healthcare staff (67%) and family members (59%) [33]. In the research by Afshari et al., the sources of information for people were mainly radio and television, physicians, and family members [14]. Kaviani et al. showed that the sources of information for people were mainly radio and television (87.7%), while the educational role of the doctors or healthcare staff was 2.2% [57]. In the studies by Buller et al. [62] and Glasser et al. [63], the individuals had received most of their information from healthcare staff, family members, friends and the media, and those whose source of information was healthcare staff had better performance than others.

The mean score of social support in the experimental group increased compared to the control group 3 and 6 months after the intervention. In a study conducted by Mirzaei et al. using social cognitive theory to prevent skin cancer, the mean score of abstract norms increased in the experimental group after the educational intervention [46]. In the study by Nadrian et al., the mean social support was obtained 68.5%. The subjects under study said that their family members were the most encouraging people and their supporters for using sun protection equipment and preventing skin cancer [34]. In the study by Hillhouse et al., the educational intervention increased the score of abstract norms in the experimental group [43].

Social support affects the disease control through two major processes: (1) direct impact of social support through health-related behaviors, such as encouraging healthy behaviors, and (2) moderating impact of social support that alleviates the effects of acute and chronic stress on health and increases the adjustment with the mental pressure caused by skin cancer [30, 64]. In the present study, no significant difference was observed between the mean scores of skin cancer preventive behaviors in both groups before and after the intervention. Three months after the intervention and 6 months after that, the mean score of the farmers' behavior in the experimental group was significantly higher than the control group, which showed the positive effect of education on the farmers' skin cancer preventive behaviors. The results of this study were in line with the findings of Sümen and Öncel [65], Velasques et al. [42], Davis et al. [40], Nadrian et al. [47],

Norman et al. [66], Hewitt et al. [67], Maseudi et al. [53], and Zareban et al. [33].

The results indicated the effectiveness of the intervention program and the necessity of using educational interventions designed to perform skin cancer preventive behaviors. One limitation of this research was self-reporting of the farmers' performance on the prevention of skin cancer. The other limitation included studying male farmers, while both genders had to be studied although the number of female farmers was small in Iran.

This study showed that eight training sessions on skin cancer preventive behaviors improved health belief model constructs and social support construct. Moreover, satisfaction with the intervention was high. The educational intervention has the potential to increase preventive behaviors and decrease the risk for skin cancer among farmers.

Education based on the health belief model and social support construct has led to the fact that with an increase in the mean of the constructs, the subjects in the experimental group performed better to prevent skin cancer. Given the vulnerability and susceptibility of the farmers and the important role of social supporters, the need for providing a fundamental solution and proper planning for the prevention of skin cancer is quite felt, and providing an educational program for family members, physicians, and other health personnel and also broadcasting educational programs on TV and radio seem essential. These models can act as a framework for designing and implementing educational interventions for the prevention of skin cancer.

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